

- a) Name of Course : B.Sc. Prog.
- b) Semester : V
- c) Name of the Paper : DSE: Green Chemistry
- d) Unique Paper Code : 32177908
- e) Duration : 3 h
- f) Maximum Marks : 75

**Instructions for Candidates:**

1. Attempt **total four** questions. **First** question for **21** marks is **compulsory**.
2. Question No **2 to 6** carries **18** marks each.
3. Attempt all parts of a question together.

**Q.1 Compulsory**

- (a) Write short answers of the following questions: (1 \* 6)
- i) Give example of a polyether green solvent.
  - ii) Who said ‘what you don’t have can’t harm you’?
  - iii) Give example of a solvent from biomass.
  - iv) Who gave the term E factor?
  - v) Who gave the concept of atom economy?
  - vi) Who wrote the book entitled “Silent Spring”?
- (b) Fill in the blanks: (1 \* 5)
- i) Wilkinson catalyst is a ..... catalyst.
  - ii) At a temperature 31.1°C and pressure 73.8 atm CO<sub>2</sub> exist as .....
  - iii) Tertbutyl tin oxide is used as .....
  - iv) ..... is known as the father of green chemistry.
  - v) The seventh principle of green chemistry states use ..... feed stocks.
- (c) Correct the following statements (1 \* 5)
- i) An azo pigment containing strontium is known as write-fit pigment.
  - ii) Use stoichiometric reagents not catalyst.
  - iii) Risk is a function of harm and exposure.
  - iv) Ultrasound refers to sound waves with frequencies lower than those detectable by the human ear.
  - v) Microwave region lies between infrared and visible.
- (d) Give a brief definition of the following terms: (1 \* 5)
- i) Auxiliary substances
  - ii) VOCs
  - iii) Sustainable development
  - iv) Atom economy
  - v) Photocatalyst

**Q. 2 (a)** Mention the chemical factors which led to the following industrial disasters: (2\* 3)  
i) Flixiborough Accident  
ii) Bhopal Gas Tragedy

**(b)** Give chemical reactions for: (2 \* 3)  
i) Sono-chemical Simmons-Smith reaction  
ii) Microwave assisted Diels Alder reaction

**(c)** Explain the following: (2 \* 3)  
i) Though water is a green solvent but it is not as widely used in reaction as it should be.  
ii) The concept of inherently safer design of a chemical reaction.

**Q. 3 (a)** Explain the various terms of the formula Risk = f (hazard, exposure). (3)

**(b)** What is the waste or pollution prevention hierarchy? Give its diagrammatic representation as a pyramid. (2,2)

**(c)** What are chloro-fluoro carbons? Why they are not preferred as solvents? How green solvents overcome these disadvantages (1,2,3)

**(d)** What purpose marine antifoulant serve? Discuss the chemistry of some environmentally safe marine antifoulants. (1,4)

**Q.4 (a)** Give one use of the following in terms of green chemistry: (2, 2)  
i) Perfluorodecalin  
ii) 4,5-dichloro-2-*n*-octyl-4-isothiazolin-3-one

**(b)** Explain why surfactants are required while dry cleaning with supercritical CO<sub>2</sub>. Give example of one such surfactant. (2,1)

**(c)** Discuss cradle to cradle carpeting. (3)

**(d)** Mention four future trends in green chemistry. (4)

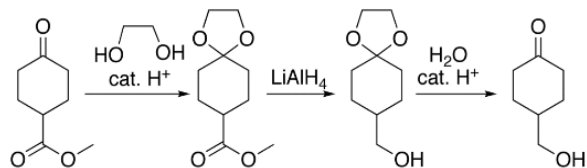
**(e)** What is co crystal controlled solid state synthesis? Give one example. (2,2)

**Q. 5 (a)** What are alternative sources of energy? Give examples. (2,2)

**(b)** What is biodiesel? How it is prepared? What is the composition of B20? (1,2,1)

**(c)** What are biocatalysts. Mention their advantage and disadvantages. (2,2,2)

(d) Why the following conversion is not considered green? Which principle of green chemistry is not followed here? (2,2)



Q. 6 (a) Write short note on: (3 \* 4)

- (i) Immobilized solvents
- (ii) Ionic liquids
- (iii) Phase transfer catalysis

(b) Give the traditional and green synthesis of disodium iminodiacetate. Explain why catalytic hydrogenation method is green. (1,3,2)

-----